

Application No.: 10/849,520
Amendment under 37 CFR 1.111
Reply to Office Action dated May 6, 2005
August 1, 2005

AMENDMENTS TO THE DRAWINGS

In Figs. 4, 5B, 11, 12B, the reference number "S1" has been amended to the reference number "SI". In Fig. 14, the reference number "630" has been amended to the reference number "930". Figs. 13 and 14 have been amended to recite the term "Prior Art". Therefore, please replace these drawing sheets for the original drawing sheets including Figs. 4, 5B, 11, 12B, 13, and 14.

Attachment: Replacement Drawing Sheets for Figs. 4, 5B, 11, 12B
13, and 14

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REMARKS

By this amendment, the specification has been editorially amended, claims 1-9 have been cancelled and new claims 10-19 have been added in the application. Currently, claims 10-19 are pending in the application.

The specification was objected to because the abstract was not related to the claimed invention. The Examiner stated that the claims were related to the structural part of the body whereas the abstract was related to the electronic parts. By this amendment, the abstract has been amended to be directed to the claimed invention as requested by the Examiner. Applicants respectfully submit that the abstract is now proper and this objection should be withdrawn.

The Examiner stated that the drawings were objected to because Figs. 13 and 14 should be designated by a legend such as -- Prior Art --. By this amendment, Figs. 13 and 14 has been amended to recite the term "Prior Art". Also, the applicants found some minor errors in Figs. 4, 5B, 11, 12B and 14. By this amendment, Figs. 4, 5B, 11 and 12B have been amended to change the reference number "S1" to the reference number "SI". Also, in Fig. 14, the

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reference number "630" has been amended to be reference number "930". It is respectfully submitted that this drawing objection has been overcome and should be withdrawn.

Claims 1 and 2 were rejected under 35 USC 103(a) as being obvious over Conduit (EP0099712) in view of Horikawa (JP 2002-267509). Claims 3-9 were rejected under 35 USC 103(a) as being obvious over Conduit in view of Horikawa and further in view of Koike (JP 08-271300).

These rejections are respectfully traversed in view of the amendments to the claims and the remarks below.

The present invention relates to a flow sensor for detecting the flow quantity of a fluid. The object of the present invention is to provide a flow sensor for enabling the user to easily check the detection state of the flow quantity in a detection section that can be miniaturized and made smaller and thinner.

In Fig. 1, the flow sensor is provided in a detection section 100 and a main unit section 200. The detection section 100 is connected to the main unit section 200 by a cable. The main unit section 200 has a display section 230.

In Fig. 4, the detection section 100 is provided by a casing member 21 and 22. The thickness t of the detection section 100

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of the flow sensor in one direction of the detection section 100 is narrowed, as shown in Fig. 5A.

The detection section 100 includes a transmitter 111, a receiver 112, a high frequency signal oscillator 120, a high frequency signal amplifier 130, a phase comparator 140, a low frequency amplifier 150, a comparator 160, a frequency divider 170, a decoder 180, a signal level determination unit 190, and a flow indicator LU. This flow indicator LU includes light emission sections 81 to 84. The light emission section 81 has a red LED (light emitting diode) 81R and a green LED 81G. Each of the light emission sections 82 to 84 has a green LED.

For example, first the green LED 81G of the light emission section 81 goes on in green as shown in FIG. 8A; next, the light emission section 81 goes off and the light emission section 82 goes on in green as shown in FIG. 8B; subsequently the light emission section 82 goes off and the light emission section 83 goes on in green as shown in FIG. 8C; and further the light emission section 83 goes off and the light emission section 84 goes on in green as shown in FIG. 8D. This operation is repeated in the order of FIG. 8A to FIG. 8D.

In this case, the light emission sections are turned on in order so as to be responsive to the detected flow quantity, so

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that the user can easily recognize the flow of the fluid from a distance. Thus, the display section can be miniaturized and the detection section can also be miniaturized.

FIG. 9 is a drawing to show an application example of the detection sections of the flow sensor according to the first embodiment of the invention. The detection section of the flow sensor according to the embodiment has a small thickness in the predetermined direction (t in FIG. 9) as shown in FIG. 5A, so that a plurality of detection sections 100 can be brought close into each other, as shown in FIG. 9.

By this amendment, new independent claim 10 recites "wherein said case has a width perpendicular to the longitudinal direction of said pipe line, said pipe line has a width perpendicular to the longitudinal direction of said pipe line, and the width of said case is approximately equal to the width of said pipe line". New independent claim 10 also recites "wherein one of said faces of said case consists of said plurality of light emitting sections and a planar face whereby the width of said case can be minimized by using said plurality of light emitting sections disposed along the longitudinal direction of said pipe line".

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These features are not shown or suggested by Conduit, Horikawa, Koike or any combination of these references.

Applicants respectfully submit that Conduit, Horikawa, Koike, which will be described below, or any combination of these references do not teach, suggest or describe a small sensor head section as described in the present invention. As shown in Fig. 9, when the pipe lines are disposed in parallel with each other, the claimed structure of the present invention can have an advantage. More specifically, a main object of the present invention is that the width of the case in an adjacent direction (in which sensor head sections are disposed adjacently to each other) is substantially the same as that of the pipe line. In the sensor head section, the indicator by which person can roughly and easily know the flow quantity is required, and thus, the pattern display (graph display) by a plurality of light emission sections is appropriate rather than a numeric display. This is because the plurality of light emitting sections can be achieved in a space as little as possible in the adjacent direction (or width) of the case. On the other hand, at the main body, since the main body is a flow sensor, it is necessary to display the flow quantity by a numeric display.

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Conduit relates to flowmeters comprising a body, an inlet, an annular member, a circular valve member, a spring, a plunger and an indicator means.

Conduit discloses that the module 40 has leads 43 from a 12V/24V D.C. power supply (not shown) and is connected to a liquid crystal display (LCD) 44 having a four-digit display capable of registering from 0 to 1999 relative to the rate of flow through the flowmeter.

Conduit also discloses that in Figs. 6 and 7, an analogue display 44' is shown in place of the digital display 44 in the integral display unit 41 and in the remote display unit RD, respectively.

Conduit also discloses that a button switch 46 enables the display 44 to be switched from the rate of flow to temperature for as long as the button is depressed.

Conduit does not disclose that the case has a width perpendicular to the longitudinal direction of the pipe line, the pipe line has a width perpendicular to the longitudinal direction of the pipe line, and the width of the case is approximately equal to the width of the pipe line as claimed in new independent claim 10.

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Conduit also does not disclose that one of the faces of the case consists of the plurality of light emitting sections and a planar face whereby the width of the case can be minimized by using the plurality of light emitting sections disposed along the longitudinal direction of the pipe line as claimed in new independent claim 10.

For these reasons, it is believed that Conduit does not show or suggest the present claimed features of the present invention. Applicants also submit that Horikawa does not make up for the deficiencies in Conduit.

Horikawa relates to a flowmeter equipped with a display. More specifically, the display displays the detected flow rate by the flowmeter.

Horikawa discloses that the flowmeter has a body case 101 and a display case and the body case and the display case are attached each other by an attachment section 103. A display case 102 has a rectangular solid shape.

Horikawa also discloses that the display case 102 has a direction display 106 which displays the flow direction of a detected fluid, and a numeric display 107, which displays the flow rate of a detected fluid as shown in Figs. 2(a) and 2(b).

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Horikawa also discloses that the flowmeter of Fig. 4 shows the modification of the flowmeter 1 as mentioned above. This flowmeter 1 is the same configuration as described above except the direction display 106 is in one side face of the display case 102 as shown in Fig. 4.

Horikawa does not disclose that a flow indicator having a plurality of light emission sections disposed on one of the faces of the case along a longitudinal direction of the pipe line and turning on a number of the plurality of light emission sections according to the detected flow quantity of the fluid as claimed in new independent claim 10.

Horikawa also does not disclose that the case has a width perpendicular to the longitudinal direction of the pipe line, the pipe line has a width perpendicular to the longitudinal direction of the pipe line, and the width of the case is approximately equal to the width of the pipe line as claimed in new independent claim 10.

Horikawa also does not disclose that one of the faces of the case consists of the plurality of light emitting sections and a planar face whereby the width of the case can be minimized by using the plurality of light emitting sections disposed along the

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longitudinal direction of the pipe line as claimed in new independent claim 10.

For these reasons, it is believed that Horikawa does not show or suggest the present claimed features of the present invention. Applicants also submit that Koike does not make up for the deficiencies in Conduit and Horikawa.

Koike relates to a vortex flowmeter accurately detecting the Karman's vortex from a low flow rate to a high flow rate.

Koike discloses that a vortex flowmeter 11 has a housing 12 and a flow rate instruction section 13 which is constructed on the housing 12. The flow rate instruction section 13 has a display 13a on the front face as shown in Fig. 1.

Koike does not disclose that a flow indicator having a plurality of light emission sections disposed on one of the faces of the case along a longitudinal direction of the pipe line and turning on a number of the plurality of light emission sections according to the detected flow quantity of the fluid as claimed in new independent claim 10.

Koike also does not disclose that the case has a width perpendicular to the longitudinal direction of the pipe line, the pipe line has a width perpendicular to the longitudinal direction of the pipe line, and the width of the case is approximately

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equal to the width of the pipe line as claimed in new independent claim 10.

Koike also does not disclose that one of the faces of the case consists of the plurality of light emitting sections and a planar face whereby the width of the case can be minimized by using the plurality of light emitting sections disposed along the longitudinal direction of the pipe line as claimed in new independent claim 10.

It is therefore respectfully submitted that Conduit, Horikawa and Koike, individually or in combination, do not teach, disclose or suggest the presently claimed invention and it would not have been obvious to one of ordinary skill in the art to combine these references to render the present claims obvious.

New dependent claims 11-19, which directly or indirectly depend from independent claim 10, have been added in the application. Applicants respectfully submit that these claims recite additional features and also define over the prior art of record. For instance, Conduit, Horikawa and Koike do not disclose that the sensor head section comprises a press member having a pair of press parts for pressing the pair of ultrasonic devices against the pipe line and a joint part for joining the pair of press parts. Conduit, Horikawa and Koike also do not

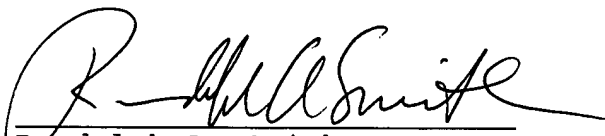
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disclose that said housing space and a space receiving said hermetic seal are connected to each other. Also, Conduit, Horikawa and Koike do not disclose that the compute section performs different processing when the alarm signal is on. Allowance of these claims is also respectfully requested.

In view of foregoing claim amendments and remarks, it is respectfully submitted that the application is now in condition for allowance and an action to this effect is respectfully requested.

If there are any questions or concerns regarding the amendments or these remarks, the Examiner is requested to telephone the undersigned at the telephone number listed below.

Respectfully submitted,


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